DOCUMENT RESUME

ED 455 774 IR 020 730

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TITLE	Student Perceptions: Printing Activities' Influence on Satisfaction with Web-Based Instruction.
PUB DATE	2000-10-00
NOTE	9p.; In: Annual Proceedings of Selected Research and Development Papers Presented at the National Convention of the Association for Educational Communications and Technology (23rd, Denver, CO, October 25-28, 2000). Volumes 1-2; see IR 020 712.
PUB TYPE	Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	*Computer Assisted Instruction; Computer Mediated Communication; Course Content; Distance Education; Instructional Design; Instructional Development; Online Systems; Printing; Screen Design (Computers); Student Attitudes; *Student Reaction; *World Wide Web
IDENTIFIERS	*Web Based Instruction

ABSTRACT

The use of Web-based and Web-enhanced instruction is growing rapidly. There is much information and discussion surrounding the layout of content on the screen and facilitating communication yet little information is available regarding the students' perception and use of online instruction. It is known that students print information available on the Web, but not why or how this affects their satisfaction with the course. This study was designed to identify factors that influence students to print course information delivered online, to ascertain if these printing activities are related to reducing barriers, and to determine if these printing activities influence students' satisfaction for learning via the Web. Implications for the design and development of Web-based instruction are discussed. The survey instrument is included at the end of this paper. (Contains 43 references.) (AEF)

ED 455 774

Student Perceptions: Printing Activities' Influence On Satisfaction with Web-Based Instruction

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Abstract

The use of Web-based and Web-enhanced instruction is growing rapidly. There is much information and discussion surrounding the layout of content on the screen and facilitating communication yet little information is available regarding the students perception and use of online instruction. Everyone knows that students print information available on the Web but not why nor how this affects their satisfaction with the course. This study was designed to identify factors that influence students to print course information delivered online, to ascertain if these printing activities are related to reducing barriers, and to determine if these printing activities influence students' satisfaction for learning via the Web. Implications for the design and development of Web-based instruction are discussed.

Designers and developers of Web-based instruction, specifically Web-enhanced instruction, assume that students use the information in the format it was designed that is, online. If fact, many learners actually transfer this information to paper by printing it. This study was designed to identify factors that influence students to print course information delivered online, to ascertain if these printing activities were related to reducing barriers, and to determine if these printing activities influence students' satisfaction for learning via the Web. These possibilities have implications for the design of Web-based instruction.

As interest in Web-based instruction (WBI) has grown, much of the discussion in professional circles has revolved around the mechanics of which software to use (McCollum, 1997); how and when to incorporate visuals (Bixler & Spotts, 1998; Dana, 1998; Milheim & Rezabek, 1997); and how to manage e-mail, listserv and threaded discussions (Friedlander & Kerns, 1998). In addition to spending time on the mechanics of Web page development, a considerable amount of the WBI designer's time is devoted to the design and layout of the screen or interface (Bixler & Spotts, 1999; Carr & Peters, 1998; Horton & Lynch, 1998; Ipek, 1999; Kahn, 1999; McCormack & Jones, 1998; Montgomery, 1998). Finally, current research has focused on online communication issues such as email, bulletin boards, and threaded discussions (Jiang, 1998; McCabe, 1997; Nasseh, 1996). These discussions do not address the aspects of evaluating learning opportunities via the Web, nor do they address concerns arising when students transfer information from the computer screen to the printed page.

The systematic approach to the design of instruction (Dick & Carey, 1990; Gagne, Briggs & Wager, 1992; Reigeluth, 1999; Seels & Glasgow, 1997; Smith & Ragan, 1993) suggests that the analysis of student characteristics is critical to the design of effective instruction. There is little research available which tells the instructional designer, course developer, or instructor, how students are actually using online course materials. Ward (1998) found that many articles have been published on instructional design issues, technical considerations, and accreditation issues of distance education courses but little has been published regarding the online distance learner's experience in his or her own words. Determining the form in which students prefer to use information, and what their learning needs are is a crucial design component for designers of WBI.

Instructional Design and the Web-based Instructor

The design of effective instructional materials is a complex task. The designer asks what is the message being delivered to the learner and what is the best way to deliver that message. With the advent of Web-based instruction, an entire new set of concerns is presented to the instructional developer. These include questions such as how to break the information up into usable pieces and how to guide the student through the now nonlinear information. At first, screen layout and design were based on well-established theories of layout for the printed page.

From the beginning of their educational experience, students learn to learn from the printed page. Researchers have had years of opportunity to study this method of information delivery. As Houle (1996) notes for print based information, much is known about such matters as readability, the display of exhibited material, the way

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potential for further follow-up as there was no way to determine which students in a class had not responded and to then contact them individually.

As responses were submitted by the participants the multiple-choice questions were tallied automatically by the WebCT program. The researcher compiled the short answer and paragraph responses for further analysis. The qualitative questions were coded based on similar and related themes of response.

Underlying Assumption

The assumption was made that students do print the information made available on a course Web site. One hundred seventy-five participants (85.37%) reported they printed pages from the course Web site. This number substantiates the assumption. Eighty-two participants (40%) reported they printed 50 or more pages from the course Web site. The average number of pages printed was approximately 30 (mean = 4.79, SD = 2.30).

Factors that Influence Students to Print

The primary research question determined factors that influenced students to print online course information.

Computer Access

Requiring students to access a computer to obtain course materials or participate in discussion forced them to be in a particular location, at the computer. The majority of participants used a computer at home (n = 148, 72.20%) or a computer in a lab on campus (n = 143, 69.76%). Twenty-two of the participants (10.73%) indicated they used a computer at work and 42 of the participants (20.49%) indicated they used a computer in other locations. Eighty of the participants (39.24%) used a computer both in a lab on campus and at home. It is important to note that analysis of the data in this study indicated that the actual location of the computer, for example at home or in a computer lab, did not affect student satisfaction with the course, students' perception that printing affected satisfaction with the course, or the number of pages printed.

Reasons for not Printing

The primary reason for not printing, reported by 12 participants (5.80%), was to save paper. The next most frequently reported reason, reported by 8 participants (3.90%), was that there were too many pages to print and it took too long. Although 19 participants who did not print provided reasons related to cost, (too many pages, to save paper, and don't own a printer) cost did not appear to be a major factor in this study.

Reasons for Printing

The data indicate that course information on the Web was not accessible during class, was not transportable, was not easy to reference, and was not tangible. The most common reason for printing, (n=71, 40.57%) was that participants printed the information to study. This was followed by; to be able to take the information with them to other locations (n=46, 26.29%), for easy reference to the materials (n=43, 24.57%), to be able to take notes on the pages, highlight them, and use them during lecture (n=36, 20.56%), and it is hard to read on the computer (n=18, 10.29%).

Each of these reasons for printing could be interpreted as a more specific indication of using the materials to study. They each support the literature indicating that location is a barrier. These reported reasons for printing also support the literature that students return the information to a format in which they are familiar (Pantel, 1997; Ruben, 1996) that is: to be able to carry the information with them as they do text books, handouts and notes; to be able to access the information in class, between class, and in multiple locations; and to be able to write on the information.

Learner Investment in Time on Course and Printing

The average time students invested in the course was 4.67 hours (SD = 3.96). The average time students invested in printing was 20 minutes (SD = 25.94). The average time students spent printing was 4% of the average total time they reported spending on the course. In addition, only three participants indicated the time it took to print as a reason not to print. Therefore the time it takes to print out online class information did not appear to be a major factor in this study.

Prior Experience

It could be expected that the more prior online course experience, the fewer pages printed. It does not appear that prior experience in learning via WBI or Web-enhanced instruction has an affect on the printing activities of students that participated in the study. Ninety-nine participants (48%) reported that this was the first course they had taken that had a Web component (mean = 1.96, SD = 1.09). Thirty-nine participants (19.02%) reported they had taken one prior course with a Web component and the same number reported two prior courses. Twenty-five participants (12.20%) indicated they had completed three or more courses with Web components.

Based on the number of pages printed by the students, further analysis was needed to determine if this printing activity was related to lack of experience with learning online. Using Spearman's Rho indicated that there is a low, positive relationship between number of prior courses and the number of pages printed ($r = .130$). This result indicated students with more prior experience in courses with a Web component printed as much as or slightly more than students with little or no prior experience. Therefore designers of WBI can not assume that students will get use to using course materials online and will not want or need to print them.

Influence on Satisfaction

The second research question determined if students' printing activity affected their satisfaction with the course.

Difficulty Using the Information on the Course Web Site and in Print

The majority of the participants (84.88%) indicated that it was moderately easy or very easy to use the information on the Web site (mean = 3.26, SD = .803). Of those who did print from the Web site, 90.62% reported it was moderately or very easy to use the information they printed (mean = 3.20, SD = 1.01). When asked what dificulties student has with printed information, fifty-one of the participants did not respond to this question, 44 participants stated that they did not have difficulties, and 18 reported that the question was not applicable. The reported difficulties were related to the format of the information to be printed. Examples included graphics that would not print or were not legible if they did print and that the format of the information printed was ruined making it difficult to find information.

Satisfaction with the Overall Course

Of the students who participated in this study 82 or 40% reported they were mildly satisfied with the course and 41 or 20% reported they were very satisfied with the course (mean = 2.60, SD = 1.04). Thirty-five percent of the participants indicated that their printing activity mildly increased their satisfaction with the course and 19% indicated that their printing activity greatly increased their satisfaction with the course (mean 3.63, SD = .996).

Printing and Its Affect on Satisfaction

Spearman's Rho was used to determine the relationship between overall satisfaction with the course and students' perception that printing affected satisfaction with the course ($r = .334$). This moderately positive relationship suggests that the more students believed that printing increased their satisfaction with the course, the more they perceived that they were satisfied with the overall course. To further examine how students' printing was related to course satisfaction, Spearman's Rho was used to determine the relationship between the number of pages printed and perception that printing affected satisfaction for the course ($r = .304$). The results indicated that the number of pages printed has a low, positive relationship to the affect that printing had on student satisfaction for the course. Namely, the more pages participants printed, the more they reported an increase in satisfaction in the course. The increase in satisfaction based on printing may have been due to the students' ability to use the information they printed in the same fashion that they would use traditional class materials.

Finally, analysis of the data showed that satisfaction for the course and students' perception that printing activities influence satisfaction were not related to where students reported they had access to a computer for the course. In addition, the number of pages printed was not related to location of a computer. In other words whether a student used a computer at home or in a campus lab for course work did not affect their perception of course satisfaction, printing activity, or the number of pages they printed.

Preference for Receiving Learning Materials

This finding was also reflected in the participants' response to their preference for receiving the materials. Fifty-nine participants (28.78%) reported that they would prefer the option to purchase a preprinted packet. Forty-nine participants (23.90%) reported that they would prefer to have a version online that is formatted for print. Fifty-

two participants (25.27%) reported they preferred to print from the screen. Thirty-three of the participants (16.10%) reported that they preferred to use the information online.

Suggestions for Designers and Developers of WBI

The recommendations reported followed three themes. The first theme was to support the students in their printing activities. This theme included recommendations such as formatting the information for print, breaking the information up into printable chunks, and providing printing options without graphics and color. The second theme was related to the actual instruction. This theme included recommendations such as instructors still needed to show enthusiasm for teaching and enhancing communication. The third theme was related to the design of the course Web site. This theme included recommendations such as providing a study guide for the Web, making the Web site more interactive, and ensuring the information on the Web was accurate.

Some of the student responses did not apply to the Web-based aspects of courses but did provide information about the attitudes and beliefs of the learners who participated in the study. Several students commented that WBI was a positive approach to learning. "Online courses have been a blessing and are absolutely a great way to take a class." "After I got used to using the web site I really enjoyed having the freedom of when to get my work done." Others expressed a very different attitude: "Taking quizzes online is fine, but learning online is not." "Please stop making Internet classes, they are just another fabrication of this increasingly impersonal world and is seemingly a waste of time." "I think that having the entire class online really took away from my learning experience and I am upset for having to pay for such a format." "Personally, I prefer to obtain written notes in a classroom format because I think that the instructor and students interaction is very important to really learn the material."

The Web is an efficient way to distribute information to students quickly and is inexpensive for the faculty/institution. Instructors and designers need to be aware of the students' perceptions of learning online and take students' concerns into consideration when developing WBI.

Implications for Design and Development of WBI

The information obtained in the study presents a number of implications for the design of WBI. These implications support the instructional design principles presented in the literature of knowing the audience and designing effective instructional materials to meet the learners' needs and preferences (Dick & Carey, 1990; Gagne, Briggs & Wager, 1992; Reigeluth, 1999; Seels & Glasgow, 1997; Smith and Ragan, 1993).

First, instructional design models indicate it is important to do as complete an analysis as possible of the audience that will be using the course Web site. This can be done by surveying students in a traditional offering of the class or in a class that is similar to or a prerequisite for the class being designed for the Web. If the students are going to print the information on the Web site to facilitate their learning, then content should be provided in a printable format. As a number of students indicated in their recommendations, they want to be able to print the information without color or graphics.

Secondly, designers should look more closely at the information they are putting online. During the phase of media selection, designers need to determine if the information simply replaces another medium or if it supplements information presented in another form. Not all educational experiences are appropriate for online technologies (Druin & Solomon, 1996; Volker & Simonson, 1995). Questions for the designer to investigate include: Is the information interactive, providing feedback for the learner? Does the information present some form of visual communication or motion that can not be presented on a black and white sheet of paper? Can the students easily access the information they need to complete assignments and study? Answers to these questions influence decisions to place course information online, to offer it in a printable version or to offer it in another form.

Thirdly, the designer needs to consider all the instructional resources available. Students did not express dissatisfaction with printing information from the course Web site. If the textual information is to be printed, then both course designers and students can save much time and energy if resources are not used to format for the screen and make text information look appealing on a computer. Instead, designers can spend valuable time and resources developing instructional activities that use the interactive and visual features of the Web. Course information that is typically printed can easily be placed on the course Web site in a printable format. This activity supports Knox's (1980) belief that alternative materials that differ in emphasis and complexity result in program flexibility and responsiveness to learners. This allows participants the option to select materials that are relevant and challenging to them, set their own pace, and maintain interest through variety. Students can use this information to enhance their learning.

Finally, the designer of WBI needs to provide information on how the Web site should be used. Pantel (1997) suggests that when the size of the nonlinear information space is unknown it can be problematic. He recommends including a site map that provides guidance for the user. Although this information was not solicited, five students made the recommendation to provide instructions for printing and three students recommended providing a study guide for the course Web site.

Recommendations for Future Studies

Many institutions of higher education believe that delivering course content on the Web is one way they will remain competitive in the educational market. Much pressure is being placed on faculty to incorporate the Web into their teaching and learning. More research is needed to determine optimum design standards for developing Web courses that enhance student learning.

This study provides support for the anecdotal evidence indicating that students print information available on a course Web site. It also suggests reasons why the students are printing. Additional research is needed to gain more specific information regarding how students use the information they print from the Web site. The primary reason reported for printing was 'to study'. This raises the question of what it means when a student says 'to study'. An investigation of the literature on how students study is warranted.

Additional research is also needed to determine if satisfaction with online learning is affected differently when the course Web site is used in combination with other course materials as in a Web-enhanced course versus a completely Web delivered course.

Finally, additional research is needed to determine if courses with Web sites which are designed to be highly interactive provide different results than those courses with Web sites which simply provide content in the form of text and graphics. Specifically, does the increased online interaction affect students' satisfaction with the course and is this affect based on the interaction or on the fact that increased online interaction would require the students to spend more time at a computer to participate in class.

Summary

Pantel (1997) states it simply when he says that one significant advantage of the Web is that it causes us to expand the notion of a document by enabling multimedia documents. Whereas print is better at presenting text, photography better at presenting images, radio better at presenting sound, and television better at presenting video, the Web's advantage is that it combines all of these media reasonably well into a single package.

When students reach post-secondary education, they have spent most of their lives devising and hopefully perfecting an effective way to learn the material presented in their classes. When faculty place their course material on the Web, they are presenting the students with a new challenge in learning. Students can learn the mechanics of accessing a Web site and navigating through it. However, it takes time to develop new study habits.

"Learning as a process (rather than an end product) focuses on what happens when the learning takes place" (Merriam & Caffarella, p. 124). If the information is to remain online, then students will need to gain new tools in how to use the information effectively while it remains online. This requires a change in students study habits. They will need new techniques to replace taking notes on the printed pages and highlighting the important information. Until new study habits are developed, or students have the ability to take notes on the Web, to highlight online, and to access the Web remotely with pocket size computers the implication for the design and development of WBI include formatting the information in a way that facilitates learning. Students' printing activity is an important consideration for the design and development of Web-based instruction.

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The questions.

1. What is the name of your course? _____
2. What is your birth date? _____
3. Please indicate your gender.
   ____male
   ____female
4. Please indicate your ethnic origin.
   _____ Asian
   _____ Black, non-Hispanic
   _____ Hispanic
   _____ American Indian
   _____ White, non-Hispanic
5. Where do you have access to a computer to access the course materials? Select all that apply.
   ___ I use a computer with Internet access at home.
   ___ I use a computer with Internet access at work.
   ___ I use a computer with Internet access in a lab on campus.
   ___ Other: public library, friend, etc.
6. Are you an undergraduate or graduate student?
   _____ undergraduate
   _____ graduate
   _____ other
7. In addition to participating in class through the class Web site do you meet face-to-face with your instructor in a classroom setting.
   _____ yes
   _____ no
8. Do you print out pages from the course Web site?
   ___ yes
   ___ no
9. If you do not print out pages from the Web site, what are the reasons why?
10. How many pages did/do you print out from the course Web site?
    0-5
    6-10
    11-20
    21-30
    31-40
    41-50
    more than 50
11. What type of information was available on the course Web site? Check all that apply.
    ___ Syllabus
    ___ Course schedule or calendar
    ___ Online discussion content
    ___ Assignments
    ___ Content

12. What other type of information was available on the course Web site?

13. What type of information was on the pages you printed? Check all that apply.
    ___ Syllabus
    ___ Course schedule or calendar
    ___ Online discussion content
    ___ Assignments
    ___ Content
14. What other information available on the course Web site did your print?
15. Why did you print the information on the course Web site?
16. On average, how much time do you spend working on this course each week?
17. On average, how much of the time that you spend working on this course is spent printing from the Web site?
18. Do you find it easy or difficult to use the course information on the course Web site?
    ___ Very difficult
    ___ Moderately difficult
    ___ Moderately easy
    ___ Very easy
19. Do you find it easy or difficult to use the course information you print from the Web site?
    ___ Very difficult
    ___ Moderately difficult
    ___ Moderately easy
    ___ Very easy
20. If you do have difficulties using the information you printed, what are they?
21. Indicate your overall satisfaction with this course.
    ___ very unsatisfied
    ___ mildly unsatisfied
    ___mildly satisfied
    ___ very satisfied
22. Does printing the Web pages increase or decrease your satisfaction for the course?
    ___ greatly decrease
    ___ mildly decrease
    ___ no affect
    ___ mildly increase
    ___ greatly increase
23. Indicate the number of courses, that require you to access a course Web site, you have completed prior to taking your current course.
    ___ 0
    ___ 1
    ___ 2
    ___ 3 or more
24. Given the following options, which would your prefer:
    ____ To purchase a printed packet of course information from a bookstore or similar location?
    ____ To print a version of the information formatted for the printed page.
    ____ To print the screens as they appear on the Web site.
    ____ To use the information online and not print.
25. Do you have recommendations for designers and instructors of online course information regarding your experiences